KEY TO FISH POSTLARVAE FROM THE SCOTIA SEA, ANTARCTICA

by

A.W. NORTH and M.G. WHITE (1)

SUMMARY. – A key to early stages of Antarctic fish from the Scotia Sea has been produced. Previously published work has been used together with collections made by British Antarctic Survey. It was found effective for most specimens of the family Nototheniidae and Channichthyidae that were available at the 'Workshop on the identification of early life history stages of Antarctic fishes,' in Paris 1-4 September, 1981.

RÉSUMÉ. – Une clé des stades juvéniles des poissons antarctiques de la Mer Scotia a été réalisée à partir des travaux déjà publiés et des collections du British Antarctic Survey. Cette clé s'est montrée efficace pour la plupart des spécimens des familles Nototheniidae et Channichthyidae disponibles lors du stage sur l'identification des stades juvéniles de poissons antarctiques (Paris 1-4 Septembre 1981).

Some populations of Southern Ocean fish have been heavily exploited during the last ten years. For many species the early stages are undescribed, and the early life histories, which may give an insight into recruitment, are still unknown. This study combines published material with that available to the authors from investigations by British Antarctic Survey to produce a key to some of these Antarctic fish postlarvae.

Materials and Methods

The key is based on examination of fish caught during two cruises of the *RRS John Biscoe* in the Scotia Sea, and a year's field study at Grytviken, South Georgia. Specimens available from several Antarctic locations at the 'Workshop on the identification of early life history stages of Antarctic Fishes', in Paris 1-4 September 1981, have also been used. Previously unpublished work by British Antarctic Survey, and published work such as Yefremenko (1979b and 1979c), and Everson (1968) have been incorporated in the key.

Characteristics used to differentiate species in the key are those observed in formalin preserved fish lying on one side, when viewed using a binocular microscope. Counts of pigment rows, spines, etc. are therefore for one side of the fish only.

(1) British Antarctic Survey, Natural Environment Research Council, High Cross, Madingley Road, Cambridge CB3 OET. England.

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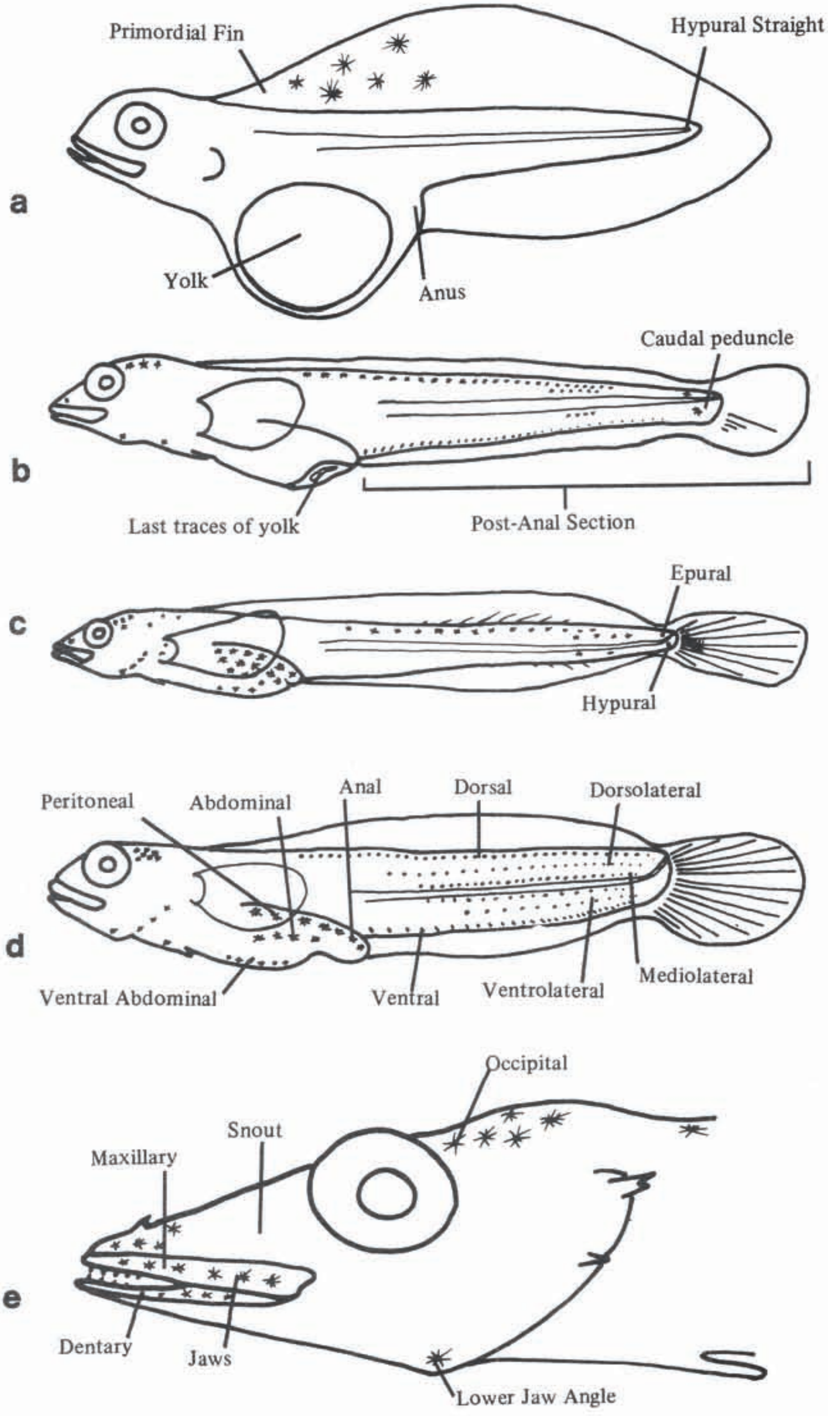

a
Primordial Fin
Hypural Straight
Yolk
Anus
b
Caudal peduncle
Last traces of yolk
Post-Anal Section
c
Epural
Hypural
d
Peritoneal
Abdominal
Anal
Dorsal
Dorsolateral
Ventral Abdominal
Ventral
Ventrolateral
Mediolateral
e
Occipital
Snout
Maxillary
Dentary
Jaws
Lower Jaw Angle

To describe the life stages and pigmentation of the fish the terminology of Russell (1976) was used (Fig. 1). Species names are those used by Norman (1938), modified by Andersen and Hureau (1979).

The key is suitable for Nototheniidae from the South Georgia area from about 14 to 35mm total length, and previously described postlarvae of Channichthyidae from 30 to 60mm total length. Some Myctophidae and other families of Notototheniiformes are also represented in the key.

Use of the Key

Examine the description given ; if it matches the specimen, proceed to the number written on the right ; if it does not, then proceed to the next description with the same number and the next consecutive letter.

Example of use of the key: in the example key below, the fish can be of four possible species, suppose the fish you chose to identify has got circular eyes with no ventral extension, and pigment spots on the snout. Starting at No. 1a this does not fit, so go to description 1b (the next description with the same number and the next consecutive letter), this matches the fish so go to the number written on the right (3a) this also fits your fish, therefore the specimen keys to species C.

Example Key

1a	Orbit of eye with ventral extension.	2a
	2a Pigment on snout.	Species A
	2b No pigment on snout.	Species B
1b	Orbit of eye circular with no ventral extension	3a
	3a Pigment on snout.	Species C
	3b No pigment on snout.	Species D

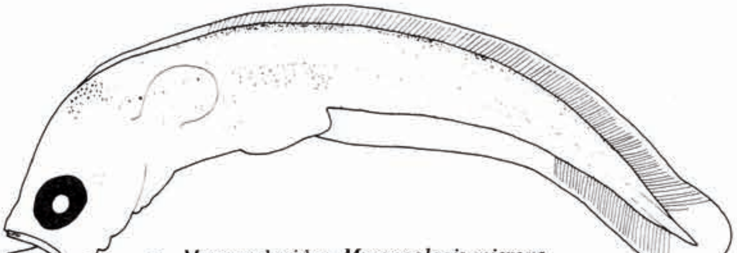
When using the key and have arrived at the probable species check this with the diagrams and fin-ray counts if possible to validate identification. Some variation in pigmentation in different individuals of the same species is quite common, especially around the operculum and in the degree of expansion of the melanophore cells, but the majority of fish have a distinct specific pattern as used in the key.

Description of the postlarvae of Antarctic Fish families included in the key

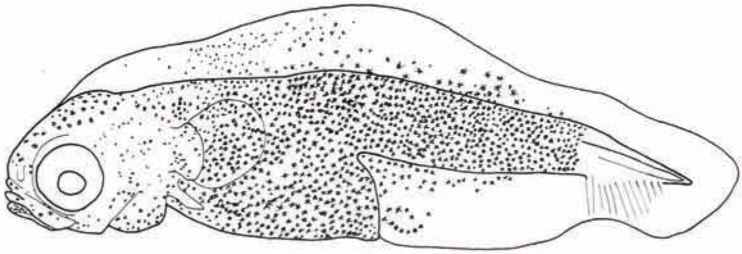
Nototheniidae: deep short snout, teeth and pelvic fin relatively short, body long slim and fusiform (Fig. 2).

Fig. 1.– Life stages and melanophore description.

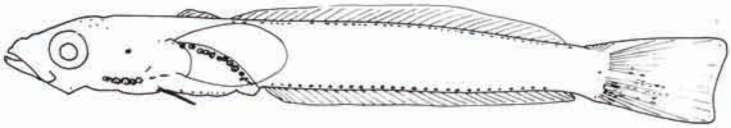
a. Recently hatched larva with yolk reserves.
b. Early postlarva, hypural straight, caudal fin-rays developing.
c. Postlarva with hypural turned up, caudal fin-rays developed and other fin-rays appearing.
d. Melanophore terminology.
e. Pigmentation on the head.



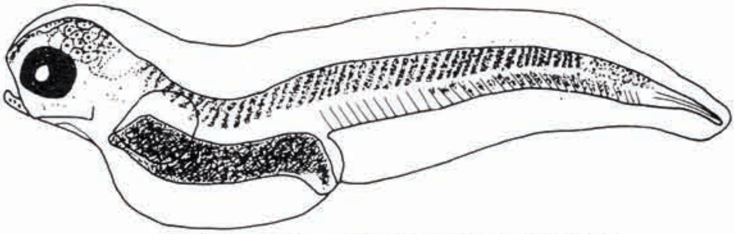
a. Muraenolepidae, *Muraenolepis microps*



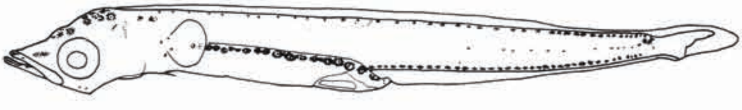
b. Harpagiferidae, *Artedidraco mirus*



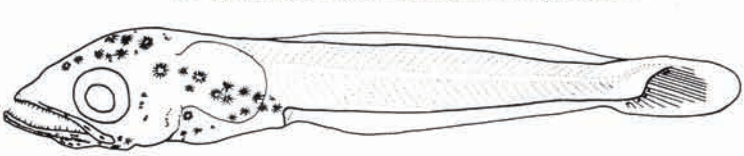
c. Nototheniidae, *Notothenia angustifrons*



d. Nototheniidae, *Notothenia coriiceps neglecta*

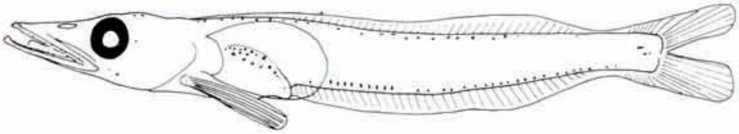


e. Bathydraconidae, *Parachaenichthys georgianus*

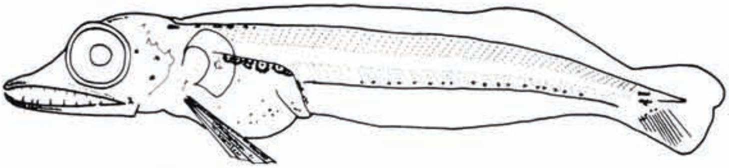


f. Bathydraconidae, *Psilodraco breviceps*

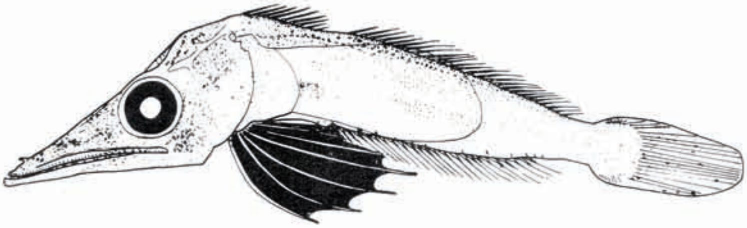
Fig. 2. – Postlarvae of the main fish families in Antarctica.



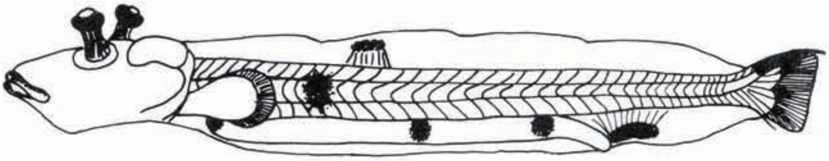
g. Channichthyidae, *Champsocephalus gunnari*



h. Channichthyidae, *Chaenocephalus aceratus*



i. Channichthyidae, *Pseudochaenichthys georgianus*



j. Bathylagidae, *Bathylagus sp.* (after Yefremenko, 1979)

Channichthyidae: long flattened snout and jaws with relatively long obvious teeth, pelvic fin relatively long, a rostral protuberance or spine, or spines on the edge of the operculum may be present. Body shape similar to Nototheniidae but with a much flatter interorbital region and a relatively deeper body (Fig. 2).

Harpagiferidae: relatively short broad deep bodied larvae (Fig. 2).

Bathydraconidae: *Psilodraco* and *Gymnodraco* similar to Channichthyidae described above but with a relatively short pelvic fin. *Parachaenichthys* similar to Nototheniidae described above but with a relatively longer body and gut (Fig. 2).

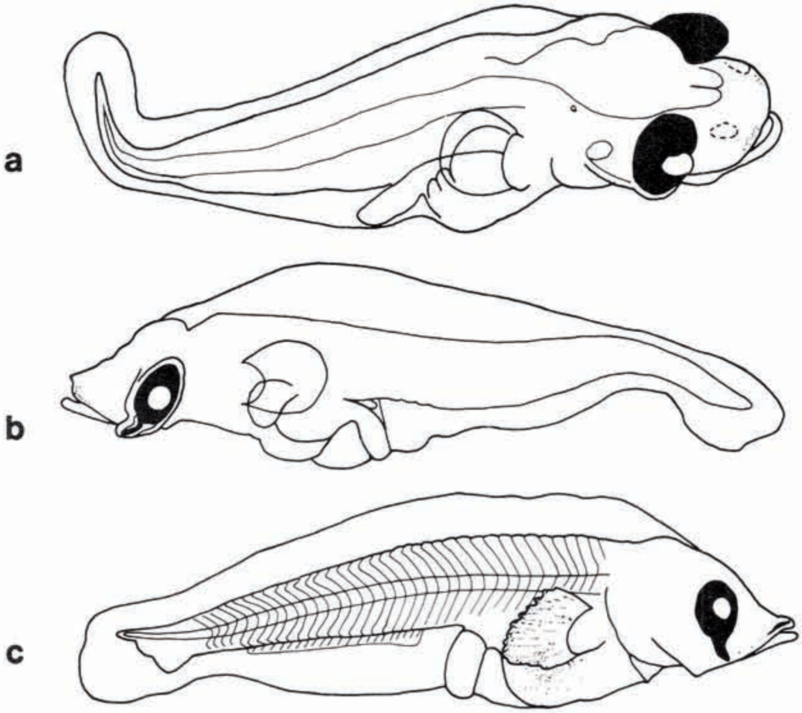


Fig. 3. – *Electrona sp.*
a. 6 mm total length ; b. 8.25 mm total length ; c. 10 mm total length.

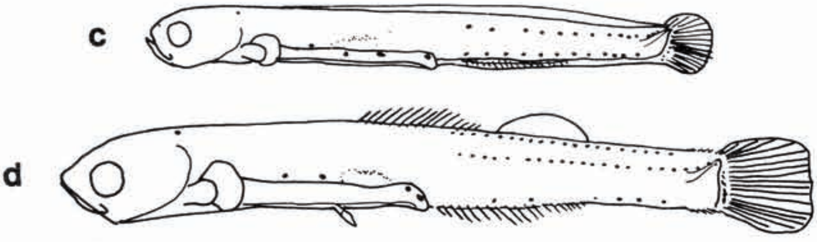


Fig. 4. – *Gymnoscopelus braueri* a. 4.5 mm ; b. 11.2 mm ; c. 13 mm ; d. 16.6 mm
(redrawn after Yefremenko, 1972)

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1a Eyes on stalks, ... *Bathylagus* sp. (Fig. 2j).

1b Eyes not on stalks 2a

2a Eyes have ventral lobe or extension to orbit ; some species of Myctophidae 3a

2b Eyes approximately circular or oval 6a

3a Relatively short gut, melanophores on upper anterior snout, in later stages the pectoral fin may be pigmented 4a

3b relatively long gut with 2-5 melanophores along the abdomen, no snout pigment 5a

4a With hypural melanophore, otherwise similar to *Electrona* sp. below (Fig. 3) . . . . *Electrona antarctica.*

4b No hypural melanophore, *Electrona* sp. possibly . . . . . . *Electrona carlsbergi.* found inshore at South Georgia.

5a With a mediolateral row of melanophores (Fig. 4) . . . *Gymnoscopelus braueri.*

5b Without a mediolateral row of melanophores . . . . *Gymnoscopelus sp.* found nearshore at South Georgia (Fig. 5).

6a Eyes oval, postlarvae elongate, length to anus less than one quarter of total length. (Notolepididae) (Fig. 6) . . . . *Notolepis coatsii*

6b Eyes circular with no ventral lobe or extension 7a

7a Deep short snout, pelvic fin relatively short, teeth short, not obvious (less than half the height of the maxillary except in *Dissostichus*). Nototheniidae, Muraenolepidae, Paraliparidae, *Parachaenichthys*, (Fig. 2) 8a

7b Long flattened snout and jaws with obvious teeth (about as long as the height of the maxillary), snout and tips of the jaws have pigment present. A rostral protuberance or spine on the edge of the operculum may be present, pelvic fin relatively long (except in Bathydraconidae: *Parachaenichthys, Psilodraco* and *Gymnodraco*). Channichthyidae 32a

8a More than 50 dorsal fin-rays which are relatively fine 9a

8b Less than 50 dorsal fin-rays 10a

9a Pectoral fin-rays well developed, caudal peduncle apparent, pelvic developing, (Fig. 7) . . . . *Paraliparis antarcticus.*

9b Pectoral fin-rays not well developed, no caudal peduncle apparent, (Fig. 8) . . . . *Muraenolepis microps.*

10a More than two-thirds of surface has melanophore pigment cells present . . 11a

10b Less than two-thirds of the fish surface has pigment cells present 13a

11a Anus extending ventrally by more than half the post-anal body depth . . . . *Artedidraco sp.*
See Fig. 9 of *Artedidraco mirus* found near South Georgia, and Fig. 10 of *A. skottsbergi* found near the Antarctic Peninsula.

11b Anus extending ventrally by less than half the body depth 12a

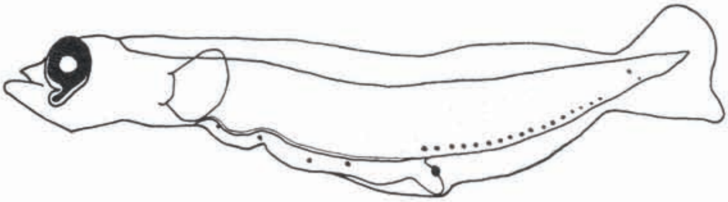

Fig. 5. – *Gymnoscopelus sp.* 8 mm total length.

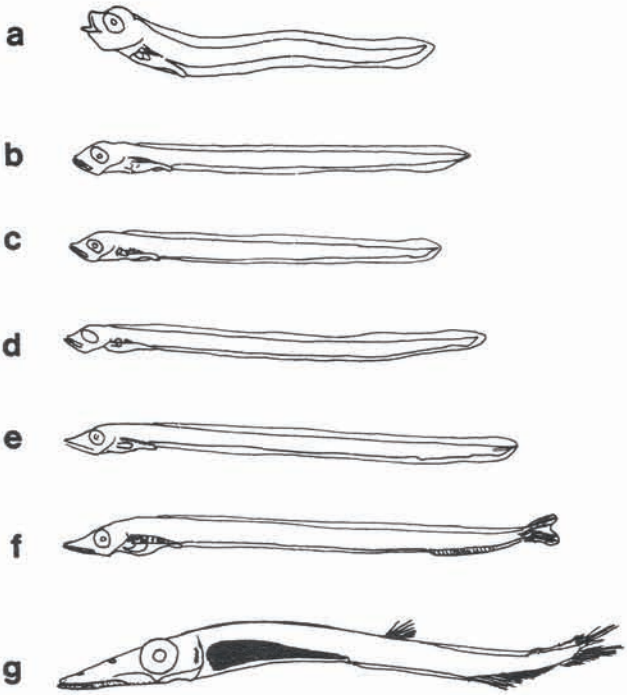

Fig. 6. – *Notolepis coatsii*. Total length : a.7.5 mm ; b.14.2 mm ; c.17.5 mm ; d.26.2 mm ; e. 28.5 mm ; f. 35.5 mm ; g.68.8 mm. (redrawn after Yefremenko, 1978)

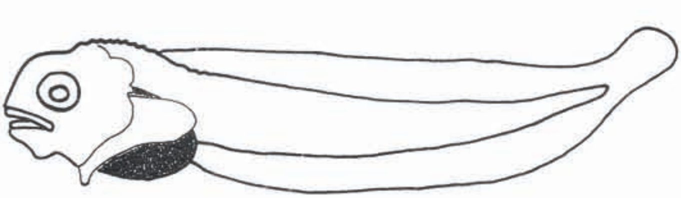

Fig. 7. – *Paraliparis antarcticus* 19.6 mm total length.

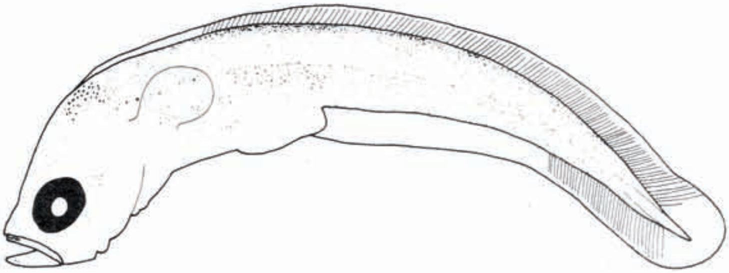

Fig. 8. – *Muraenolepis microps* 16.6 mm total length.

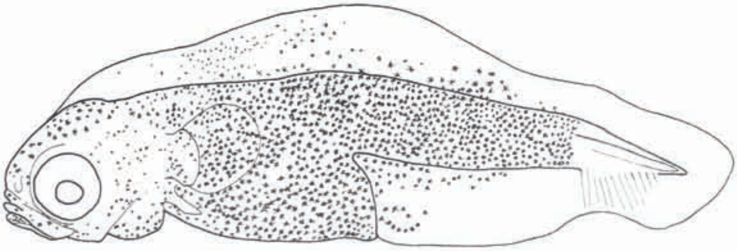

Fig. 9. – *Artedidraco mirus* 10 mm total length.

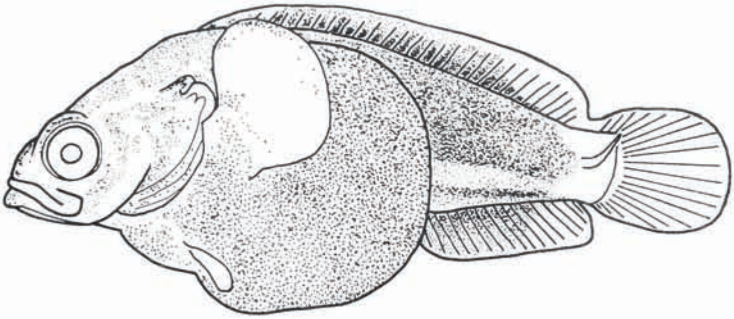

Fig. 10. – *Artedidraco skottsbergi* 27 mm total length.

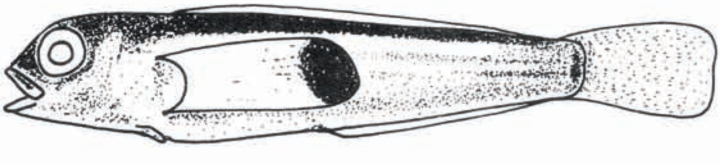

Fig. 11. – *Notothenia coriiceps neglecta* fingerling 83 mm total length.

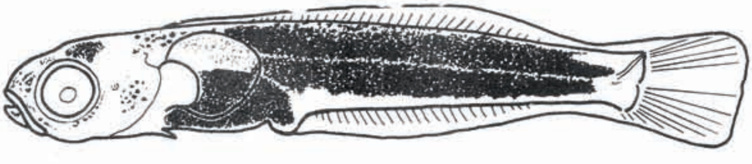

Fig. 12. – *Notothenia rossii marmorata* 25 mm total length.

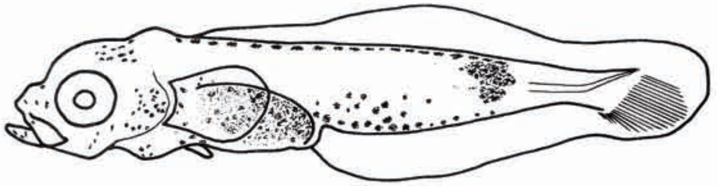

Fig. 13. – *Harpagifer sp.* 13.5 mm total length.

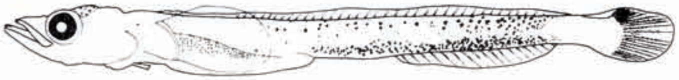

Fig. 14. – *Parachaenichthys georgianus* 28.75 mm total length.

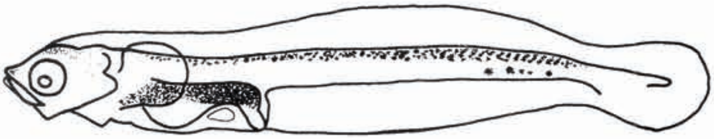

Fig. 15. – *Notothenia coriiceps neglecta* 16.8 mm total length.

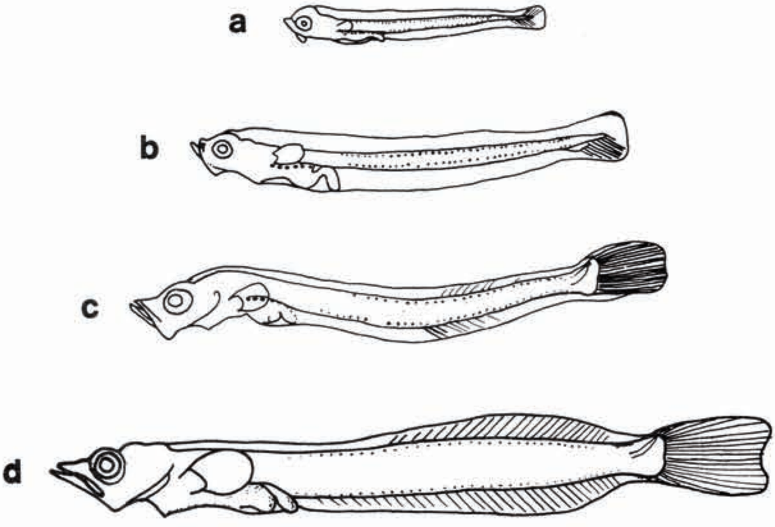

Fig. 16i. – *Pleuragramma antarcticum* a.6 mm, b.11.5 mm, c.13,5 mm, d. 25 mm ; total length (after Regan, 1916).

12a Pigmented all over, with a dorsolateral row of spine-like scales . . . . *Prionodraco evansii.*

12b Pigment on the posterior of the pectoral fin . . *Notothenia coriiceps neglecta* (Fig. 11).

12c Posterior of pectoral fin has no pigment present . . . . *Notothenia rossii marmorata* (Fig. 12).

13a Dorsal pigment row extending more than two-thirds of the post-anal section 14a

13b Dorsal pigment row not present or extending less than half the length of the post-anal section 25a

14a With dorso-lateral or mediolateral melanophores 15a

14b Without dorsolateral of mediolateral melanophores 23a

15a With more than two posterior ventrolateral melanophores (excluding caudal peduncle pigment) 16a

15b With no posterior ventrolateral melanophores present 19a

16a Vertical pigment bar on post-anal section 17a

16b No vertical pigment bar on post-anal section 18a

17a Postlarvae relatively short and deep (Fig. 13) . . . . *Harpagifer sp.*

17b Relatively long and slim. (Fig. 14) . . . . *Parachaenichthys georgianus* from near South Georgia,
or from further south (>60°S) . . . . *P.charcoti*

18a Dorsal row pigmentation dense, extending anteriorly to mid-gut level (Fig. 15) . . . . *Notothenia coriiceps neglecta*

18b Dorsal row pigmentation consisting of an isolated series of melanophores ; a dorsolateral row part developed, numerous pigment cells on caudal fin, and in lateral rows situated on the myosepta (Fig. 16i and ii) . .
. . . . *Pleuragramma antarcticum*

19a No ventral abdominal melanophores 20a

19b Ventral abdominal melanophores present 21a

20a Gut relatively long, posterior internal notochordal/mediolateral melanophores present (Fig. 17) . . . . *Parachaenichthys georgianus*

20b Gut relatively short, no posterior internal notochordal/mediolateral melanophores present (Fig. 18) . . . . *Notothenia rossii marmorata*

21a Fin-ray counts D_2 28-30, A 29-31, P 19-21 (Fig. 19) . *Notothenia angustifrons*

21b Fin-ray counts D_2 more than 30 . . . . 22a

22a Fin-ray counts D_2 31-34, A 31-34, P 21-23 . . . . *Notothenia gibberifrons*

22b Fin-ray counts D_2 (32) 33-36 (38), A 32-36, P 24-25 (Fig. 20) . . . . *Notothenia (Trematomus) newnesi*

23a Ventral abdominal melanophores absent (Fig. 16i and ii) . . . . *Pleuragramma antarcticum*

23b Ventral abdominal melanophores present 24a

24a Fin-ray counts D_2 28-30 (32), A 29-31, P 19-21 (Fig. 19) . . . . *Notothenia augustifrons*

24b Fin-ray counts D_2 31-34, A 31-34, P 21-23 (Fig. 21) . . . . *Notothenia gibberifrons*

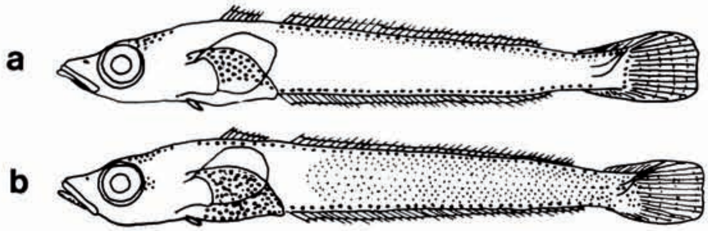

Fig. 16ii. – *Pleuragramma antarcticum.* Total length: a.53.7-60 mm, b.61.5-64.5 mm (redrawn after Yefremenko, 1979c).

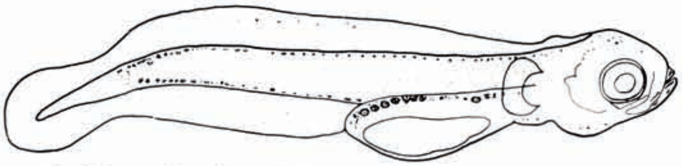

Fig. 17a. – *Parachaenichthys georgianus* 15 mm total length.

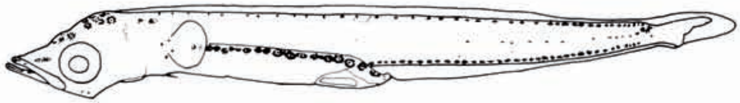

Fig. 17b – *Parachaenichthys georgianus* 22,5 mm total length.

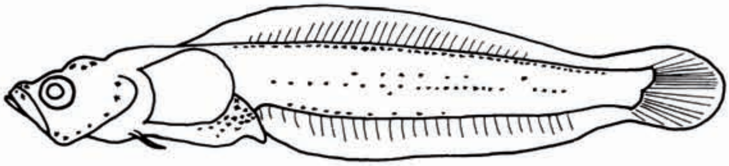

Fig. 18. – *Notothenia rossii marmorata* 16.2 mm total length (after Everson, 1968).

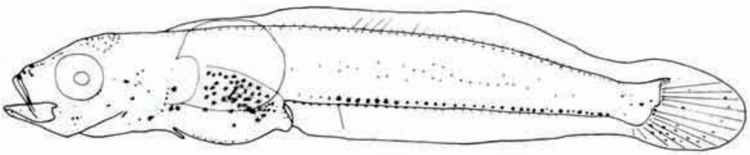

Fig. 19. – *Notothenia angustifrons* 11.75 mm total length.

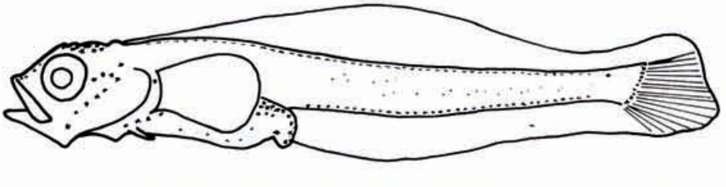

Fig. 20. – *Notothenia (Trematomus) newnesi* 15,3 mm total length (after Everson, 1968).

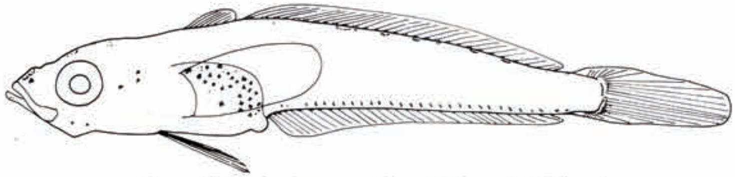

Fig. 21. – *Notothenia angustifrons* 25 mm total length.

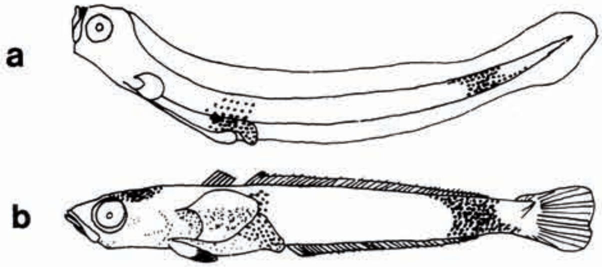

Fig. 22. – *Notothenia kempi*. Total length: a.9.2-11.6 mm, b.41.5-47.5 mm (redrawn after Yefremenko, 1979c).

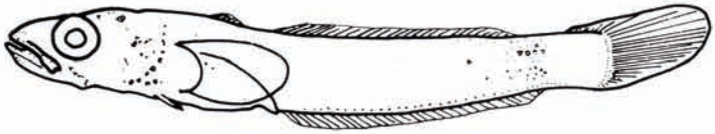

Fig. 23. – *Dissostichus eleginoides* 46.5 mm total length.

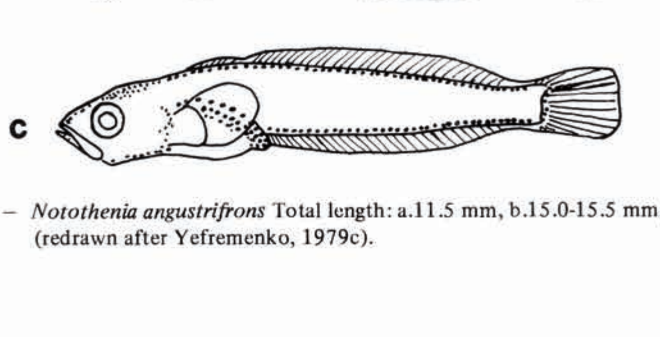

Fig. 24. – *Notothenia angustrifrons* Total length: a.11.5 mm, b.15.0-15.5 mm, c.17.2-20.0 mm (redrawn after Yefremenko, 1979c).

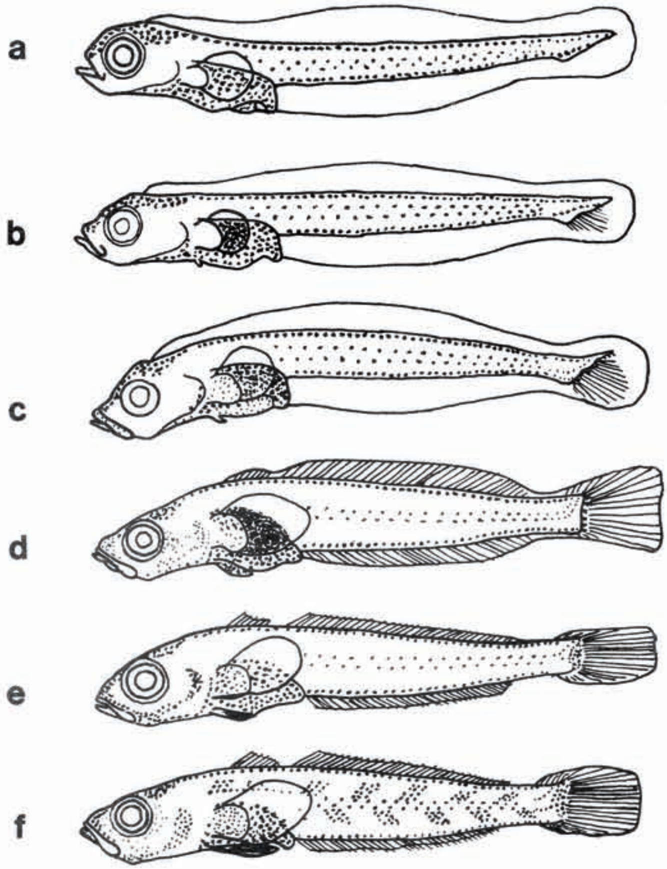

Fig. 25. – *Notothenia gibberifrons.* Total length: a.8.5-11 mm, b.11.6-13.5 mm, c.14.0-14,5 mm, d.18.3-23.5 mm, e.28.5-32.0 mm, f.36.0-38.5 mm (redrawn after Yefremenko, 1979c).

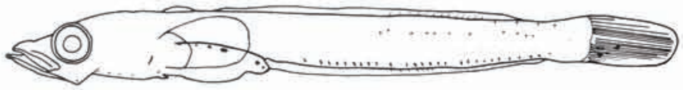

Fig. 26a.– *Patagonotothen larseni* 20.5 mm total length.

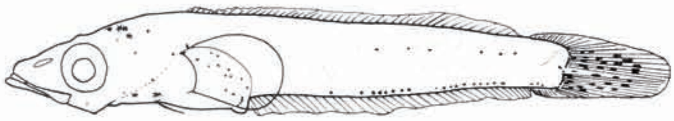

Fig. 26b.– *Patagonotothen larseni* 35 mm total length.

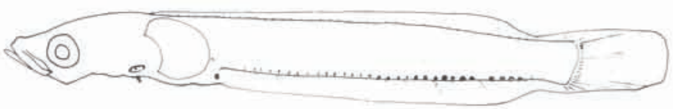

Fig. 27a.– *Notothenia (Trematomus) hansoni* 24 mm total length.

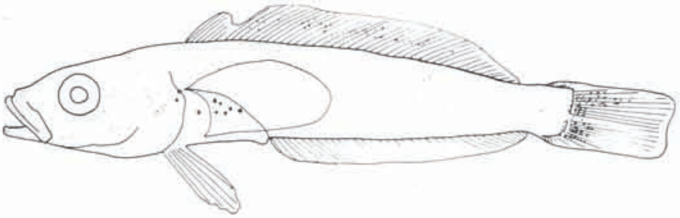

Fig. 27b.– *Notothenia (Trematomus) hansoni* 50.5 mm total length.

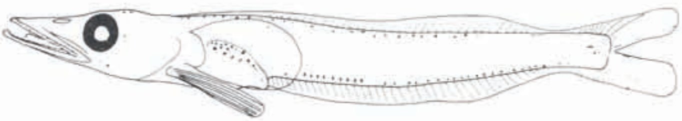

Fig. 28. – *Champsocephalus gunnari* 37.25 mm total length.

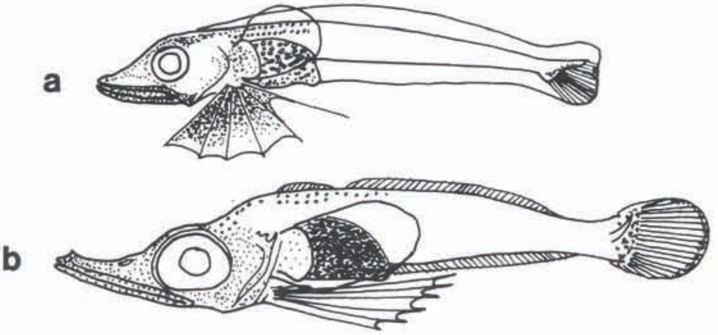

Fig. 29. – *Pseudochaenichthys georgianus*. Total length: a.24.5 mm, b.33.8 mm (redrawn after Yefremenko, 1979b).

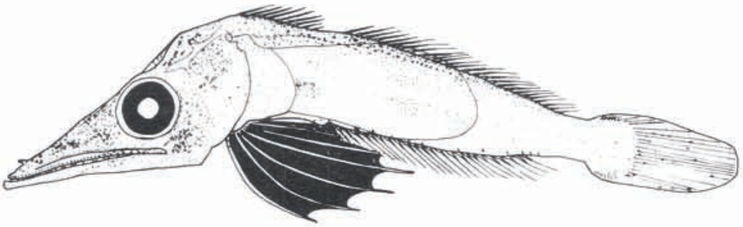

Fig. 30. – *Pseudochaenichthys georgianus* 71.5 mm total length.

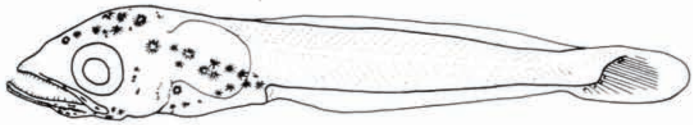

Fig. 31. – *Psilodraco breviceps* 18.25 mm total length.

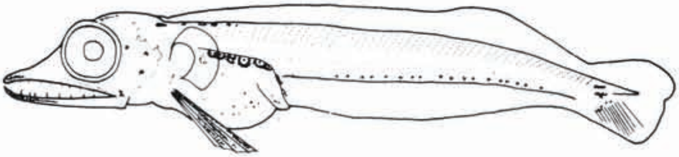

Fig. 32. – *Chaenocephalus aceratus* 16 mm total length.

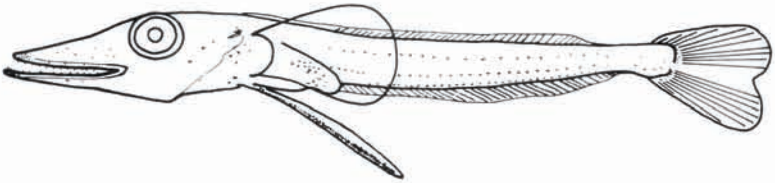

Fig. 33. – *Chaenocephalus aceratus* 60 mm total length.

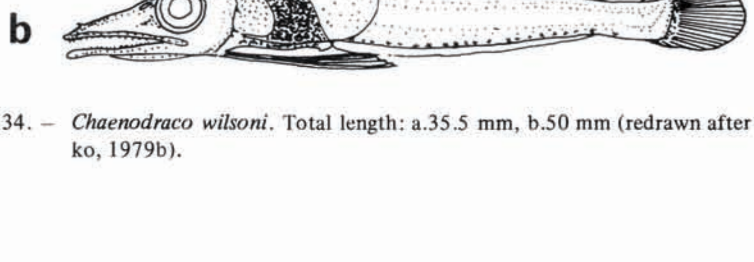

Fig. 34. – *Chaenodraco wilsoni*. Total length: a.35.5 mm, b.50 mm (redrawn after Yefremenko, 1979b).

25a With a vertical band of melanophores on the posterior of the post-anal section, or dorsolateral and ventrolateral melanophores both present near the posterior only 26a

25b No ventrolateral posterior pigment band present 28a

26a Teeth not relatively large 27a

26b Relatively large teeth and broad head. No dorsolateral or mediolateral melanophores above peritoneal pigmentation. Fin-ray counts D_2 26-29, A 26-30 (Fig. 23) . . . . *Dissostichus eleginoides*
found apprimately north of 60°S and . . . . *D. mawsoni*
found near the Antarctic continent.

27a A row or rows of melanophores above the peritoneal band of melanophores, (anterior dorsolateral melanophores above the gut), teeth not large. Fin-ray counts D_2 36-38, A 32-33 (Fig. 22) . . . . *Notothenia kempi*

27b Teeth not large and well developed, no melanophores above the peritoneal band. Fin-ray counts D_2 (33) 34-38 (39), A 31-34 (35), P (21) 23-25 (26). . . . . *Notothenia (Trematomus) bernacchii*

28a Ventral abdominal melanophores present 29a

28b Ventral abdominal melanophores absent 30a

29a Diameter of eye 23-30 % of head length (Fig. 24) . . *Notothenia angustifrons*

29b Diameter of eye 32-44 % of head length (Fig. 25) . . *Notothenia gibberifrons*

30a With dorsolateral melanophores (Fig. 26) . . . . . . *Patagonotothen larseni*

30b Without dorsolateral melanophores. 31a

31a Ventral melanophores present at the base of the fin-rays (sub-dermal in later stages), fin-ray count $P_1 > 23$. (Fig. 17) . . *Notothenia (Trematomus) hansoni*

31b Fin-ray count $P_1 \leqslant 23$ . . . . *Notothenia nudifrons*

32a No mediolateral, posterior-dorsolateral or ventrolateral pigment present. Dorsolateral pigment row if present only extends from the head to the level of the anus 33a

32b Either, mediolateral posterior-dorsolateral, or ventrolateral pigment present 36a

33a Complete dorsal pigment row present. Compare Fig. 28 and Fig. 32. . . . . *Champsocephalus gunnari*
early postlarval stages of Channichthyidae, or

33b No post-anal dorsal pigment. Early stages of Channichthyidae (Fig. 32) or . 34a

34a Pelvic fin well developed and pigmented, (Fig. 29 and Fig. 30) . . . . *Pseudochaenichthys georgianus*

34b Pelvic fin not well developed, poorly pigmented 35a

35a Pectoral fin with > 24 fin-rays (Fig. 31) . . . . *Psilodraco breviceps*

35b Pectoral fin with < 23 fin-rays . . . . *Gymnodraco acuticeps*

36a Only one lateral row of melanophores above and one below the notochord (dorsolateral and ventrolateral), plus one ventral fin-base row. No definite rostral spine although a slight protuberance may be present (Fig. 33) . . . . *Chaenocephalus aceratus*

36b More than one parallel row of melanophores above and below the notochord 37a

37a Less than 5 lateral rows of melanophores excluding fin-base row 38a

37b More than 5 lateral rows of melanophores, excluding ventral fin-base row. Pelvic does not extend further than the mid-point from the anus to the caudal peduncle (Fig. 36) .... *Chionodraco hamatus*

38a Rostral spine present, gill cover may have 6 spine-like protuberances. Pelvic fin not long enough to extend posteriorly to the mid point from the anus to the caudal peduncle (Fig. 34) .... *Chaenodraco wilsoni*

38b Rostral spine absent, pelvic fin long enough to extend posteriorly to at least half or further than the mid-point from the anus to the caudal peduncle (Fig. 35) .... *Cryodraco antarcticus*

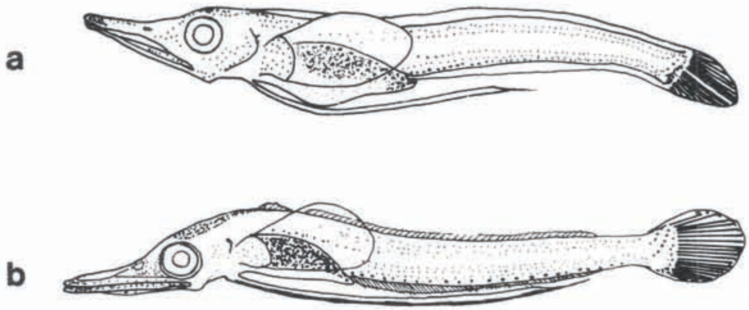

Fig. 35. – *Cryodraco antarcticus.* Total length: a.42.5 mm, b.57.5 mm (redrawn after Yefremenko, 1979b).

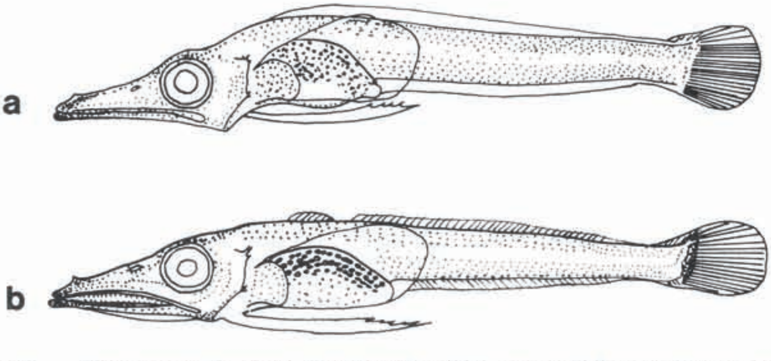

Fig. 36. – *Chionodraco hamatus.* Total length: a.35.5 mm, b.48.8 mm (redrawn after Yefremenko, 1979b).

Other species are yet undescribed and, to make certain of identification, a serial selection of early stages from larva to juvenile are required for each species. Fin-ray counts are often useful to validate identification of late postlarvae. Table I gives fin-ray counts for some Antarctic fish species.

TABLE I. – Fin-ray counts for some Antarctic Fish

Species	longest dorsal	anal	pectoral
Notothenia kempi	36-38	32-33	24-26
Patagonotothen larseni	35-41	36-40	23-26
Notothenia gibberifrons	31-34	31-34	21-33
Notothenia nudifrons	36-40	34-36	22-23
Notothenia augustifrons	28-30	29-31	19-21
Notothenia coriiceps neglecta	35-41	27-32	16-19
Notothenia rossii marmorata	32-36	26-30	20-24
Notothenia (Trematomus) newnesi	33-36	32-36	24-25
Notothenia (Trematomus) bernacchii	34-38	31-35	23-25
Notothenia (Trematomus) vicarius	33-38	31-32	22-25
Notothenia (Trematomus) hansoni	36-41	33-36	27-29
Dissostichus eleginoides	26-29	26-30	25-26
Dissostichus mawsoni	25-27	25-26	27-29
Pleuragramma antarcticum	33-38	36-39	20-21
Artedidraco mirus	23-25	16-18	16-17
Artedidraco skottsbergi	24-27	17-20	15-17
Harpagifer sp.	21-26	16-21	16-18
Prionodraco evansii	34-38	29-33	21-22
Parachaenichthys georgianus	43-46	30-33	21-23
Psilodraco breviceps	27-30	27-29	25-27
Gymnodraco acuticeps	28-30	24-26	21-22
Champsocephalus gunnari	37-40	36-39	25-27
Pseudochaenichthys georgianus	29-31	28-31	23-24
Chaenocephalus aceratus	38-40	37-40	25-26
Cryodraco antarcticus	40-44	42-46	23-25
Chionodraco hamatus	37	33-35	22-24
Chaenodraco wilsoni	38-42	32-35	22-24

Conclusions

There are still many early stages of Antarctic fish species yet to be described. Specimens need to be obtained throughout the year to provide the serial stages for identification. This could be achieved by artificial culturing and frequent sampling from Antarctic research stations, combined with shipborne sampling on the continental shelves. International exchange of specimens and information may help establish a sequence of stages more readily, especially if countries are operating at different places and times of the year.

There is still much to learn about the early parts of the life cycles of Antarctic fish including, development rates, trophic relationships and population dynamics. Work on these aspects is basic to an understanding of Antarctic fish ecology.

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